



Prevalence of Wrist and Hand Repetitive Strain Symptoms Among Nurses Performing Intravenous Cannulation and Clinical Documentation: A Cross-Sectional Study

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Abstract

Background: Nurses routinely perform repetitive and precision-based occupational activities, including intravenous cannulation and clinical documentation. These activities involve repetitive wrist and hand movements, gripping, pinch force, sustained postures and fine motor control, which may contribute to work-related wrist and hand musculoskeletal symptoms. Although work-related musculoskeletal disorders among nurses have been widely studied, comparatively less attention has been given to wrist and hand symptoms associated with repetitive nursing tasks.

Objective: To determine the prevalence and severity of wrist and hand repetitive strain symptoms among nurses performing intravenous cannulation and clinical documentation using the Patient-Rated Wrist and Hand Evaluation (PRWHE).

Methods: A cross-sectional observational study was conducted among nurses aged 21–50 years at Dr. Ulhas Patil Medical College and Hospital, Jalgaon, over a period of six months. A total of 165 nurses meeting the predefined eligibility criteria participated in the study. Demographic and occupational information including age, gender, hand dominance, clinical experience, weekly working hours and documentation duration was collected. Wrist and hand symptoms and functional limitations were assessed using the Patient-Rated Wrist and Hand Evaluation. Data were entered into Microsoft Excel and analysed descriptively.

Results: A total of 165 nurses participated in the study. The mean age was 24.98 ± 3.71 years and the mean clinical experience was 3.66 ± 2.57 years. Participants worked an average of 48.24 ± 1.21 hours per week and spent an average of 17.23 ± 4.59 hours per week performing clinical documentation. Most participants were aged 21–35 years (161; 97.57%), female (130; 78.78%) and right-hand dominant (152; 92.12%). Regarding PRWHE severity, 98 participants (59.39%) had mild symptoms, 58 (35.15%) had moderate symptoms, 7 (4.24%) had minimal symptoms and 2 (1.21%) had severe symptoms.

Conclusion: Wrist and hand repetitive strain symptoms were common among nurses performing intravenous cannulation and clinical documentation, with mild and moderate symptom severity predominating. The findings highlight the importance of early occupational screening, ergonomic education, adequate recovery periods and preventive physiotherapy strategies to reduce the occupational burden of wrist and hand symptoms among nurses.

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1. Introduction

Repetitive strain injuries (RSIs) are a group of musculoskeletal conditions that develop due to repeated or prolonged low-intensity stress on the body's soft tissues, including muscles, tendons, ligaments, and peripheral nerves. Rather than representing a single diagnosis, RSI is an umbrella term encompassing disorders caused by repetitive movements, awkward postures, sustained force, vibration, and other occupational or non-occupational risk factors. ^[1, 2] These injuries typically develop gradually

and may worsen over time when tissues are repeatedly exposed to mechanical loading without sufficient recovery, making RSI a significant occupational health concern worldwide.^[1] The development of RSI involves both mechanical and physiological mechanisms. Repetitive movements do not allow muscles, tendons, or ligaments adequate recovery time, resulting in cumulative microtrauma and tissue damage.^[2]

RSI commonly develops in individuals who perform repetitive movements during their occupational or daily activities and can result in pain, stiffness, weakness, numbness, and functional limitations. Occupational factors such as the frequency and duration of repetitive tasks, applied force, and poor ergonomic conditions contribute to the development of RSI.^[3] Mechanical factors, such as elastic deformation of connective tissues due to increased intramuscular pressure, together with physiological changes including electrochemical and metabolic imbalances, contribute to muscle strain and pain.^[2] Furthermore, prolonged static muscle contraction with inadequate rest reduces local blood circulation, leading to muscle fatigue and hypersensitivity of pain receptors, causing pain even during low levels of stimulation. Similarly, repetitive tendon loading and overuse contribute significantly to the development of repetitive strain injuries. Although RSI may occur in the general population, occupation-related factors considerably increase its risk.^[2]

Nurses are among the occupational groups most susceptible to work-related musculoskeletal disorders (WMSDs) because of the repetitive and physically demanding nature of their profession. Work-related musculoskeletal disorders have become one of the most common occupational health problems among nurses.^[4, 5] High musculoskeletal injury rates have been documented among healthcare workers involved in direct patient care, particularly during activities such as intravenous (IV) insertion, medication administration, documentation, patient handling, and prolonged clinical procedures. Nurses have one of the highest rates of musculoskeletal injuries among all occupations.^[5] Previous studies have reported annual prevalence rates of back injuries ranging from 30% to 60%, neck disorders from 31% to 48%, and shoulder disorders from 43% to 53% among nurses. In another study involving registered nurses, the prevalence of musculoskeletal disorders was reported to be 24% for the neck, 22% for the shoulder, and 32% for the back, highlighting nurses as a high-risk occupational group for work-related musculoskeletal disorders.^[5]

Among these occupational tasks, frequent intravenous (IV) insertion and documentation place considerable biomechanical stress on the wrist and hand. IV insertion requires repetitive gripping, sustained pinch force, forearm pronation-supination, wrist flexion-extension, and fine motor control to achieve accurate cannulation. Likewise, documentation, whether handwritten or electronic, involves prolonged writing, typing, repetitive keyboard use, mouse handling, and sustained wrist postures. Repeated exposure to these precision-based activities without adequate recovery may lead to cumulative microtrauma of the muscles, tendons, ligaments, and peripheral nerves of the wrist and hand, thereby increasing the risk of repetitive strain injuries.^[6]

The study have also reported a considerable prevalence of wrist and hand musculoskeletal symptoms among nurses and other healthcare professionals performing repetitive upper-

limb tasks. Frequent manual procedures, repetitive hand movements, prolonged gripping, and computer-based documentation have been associated with increased wrist and hand pain, reduced grip function, and functional disability. These findings suggest that repetitive occupational tasks involving the distal upper extremity may contribute substantially to the development of wrist and hand repetitive strain injuries.^[7]

Although previous studies have demonstrated a high prevalence of work-related musculoskeletal disorders among nurses, the majority have focused on disorders affecting the neck, shoulders, and lower back. Comparatively few studies have specifically investigated repetitive strain injuries involving the wrist and hand among nurses performing repetitive precision tasks such as frequent intravenous insertion and documentation. Furthermore, the relationship between these occupational activities and wrist and hand pain, functional disability, and their impact on nursing performance remains underexplored.^[5] Therefore, further studies are required to determine the prevalence of wrist and hand repetitive strain injuries and identify the occupational factors contributing to these conditions among nurses.

The Patient-Rated Wrist and Hand Evaluation (PRWHE) is a wrist- and hand-specific patient-reported outcome measure developed to assess pain and functional disability associated with wrist and hand disorders. Studies have demonstrated that the PRWHE is a valid, reliable, responsive, and easy-to-administer questionnaire for evaluating wrist and hand function.^[8, 9, 10] Owing to its excellent psychometric properties, the PRWHE is an appropriate outcome measure for assessing the impact of repetitive strain injuries among nurses engaged in repetitive occupational tasks.

Therefore, the present study aims to determine the prevalence of repetitive strain injuries of the wrist and hand among nurses performing frequent intravenous insertion and documentation using the Patient-Rated Wrist and Hand Evaluation (PRWHE). The findings of this study may contribute to a better understanding of the occupational burden of wrist and hand repetitive strain injuries among nurses and may provide evidence to support preventive strategies, ergonomic interventions, and workplace health policies aimed at reducing work-related musculoskeletal disorders in this population.

2. Methods

2.1. Study Design

A cross-sectional observational study was conducted to assess wrist and hand repetitive strain symptoms among nurses performing intravenous cannulation and clinical documentation. The study was conducted over a period of six months.

2.2. Study Setting

The study was conducted at Dr. Ulhas Patil Medical College and Hospital, Jalgaon, Maharashtra, India.

2.3. Participants

The study included registered/staff nurses who were routinely involved in intravenous cannulation and clinical documentation. The calculated minimum sample size was 165 participants, based on an assumed prevalence of 19%, 95% confidence level, Z value of 1.96 and absolute precision of 6%. A total of 165 nurses were included in the study.

2.4. Eligibility Criteria

Inclusion criteria

- Registered nurses/staff nurses currently employed at the hospital.
- Performed intravenous cannulation and clinical documentation as part of routine duties.
- Aged 21–50 years.
- Worked ≥ 40 hours per week.
- Had a minimum of 12 months of continuous clinical work at the institution.
- Willing to provide written informed consent and participate in the study.

Exclusion Criteria

- History of major upper-limb trauma or hand/wrist surgery during the preceding 12 months.
- Diagnosed neurological disorder affecting the upper limb.
- Systemic rheumatological condition affecting the upper limb.
- Pregnancy-related musculoskeletal conditions.
- Active treatment for an upper-limb disorder.
- Long-term leave exceeding four weeks during the preceding three months or not currently undertaking regular clinical duties.

2.5. Occupational Exposure Assessment

Demographic and occupational information was collected using a structured evaluation sheet. Recorded variables included age, gender, hand dominance, department/ward, designation, years of clinical experience, average shift duration, weekly working hours and hours of clinical documentation per week. The study specifically focused on nurses routinely performing intravenous cannulation and

clinical documentation.

2.6. Outcome Measures

The Patient-Rated Wrist and Hand Evaluation (PRWHE) was used to assess wrist and hand pain and functional disability. The questionnaire contains 15 items divided into pain (5 items; maximum score 50) and function (10 items; maximum score 50), giving a total score of 0–100. Each item is scored from 0 to 10, with higher scores indicating greater pain and functional disability.

The study recorded pain score, functional score and total PRWHE score for each participant.

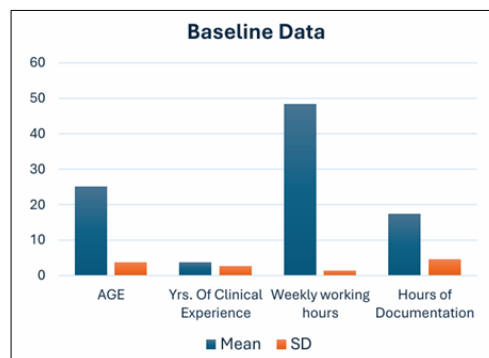
2.7. Data Collection Procedure

Institutional ethical approval was obtained before commencement of the study. Eligible nurses were screened according to the inclusion and exclusion criteria. The study procedure was explained to eligible participants and written informed consent was obtained. Demographic and occupational information was collected, including age, clinical experience, shift characteristics, frequency of IV insertion, documentation duration and work duration. The PRWHE was then administered to assess wrist and hand pain and functional limitations. The collected data were entered into Microsoft Excel for analysis.

2.8. Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon before commencement of the study. Written informed consent was obtained from participants after explaining the purpose and procedure of the study. Participants were informed that participation was voluntary and that they could withdraw at any time.

Variable	Mean	SD
Age (years)	24.98	3.71
Years of clinical experience	3.66	2.57
Weekly working hours	48.24	1.21
Hours of documentation	17.23	4.59



2.9. Statistical Analysis

The collected data were entered into Microsoft Excel and analysed descriptively. Continuous variables were summarized using mean and standard deviation, while categorical variables were presented as frequencies and percentages. The distribution of participants according to demographic characteristics and PRWHE severity was presented in tabular and graphical form.

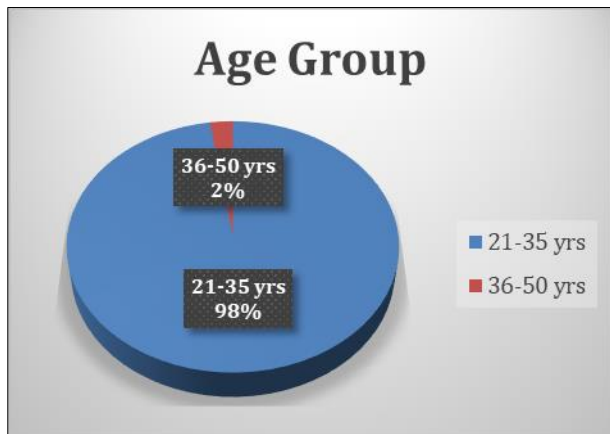
3. Results

3.1. Baseline Characteristics

A total of 165 nurses participated in the study. The mean age of participants was 24.98 ± 3.71 years, while the mean duration of clinical experience was 3.66 ± 2.57 years. Participants worked an average of 48.24 ± 1.21 hours per week and spent an average of 17.23 ± 4.59 hours per week performing clinical documentation.

3.2. Age wise Distribution

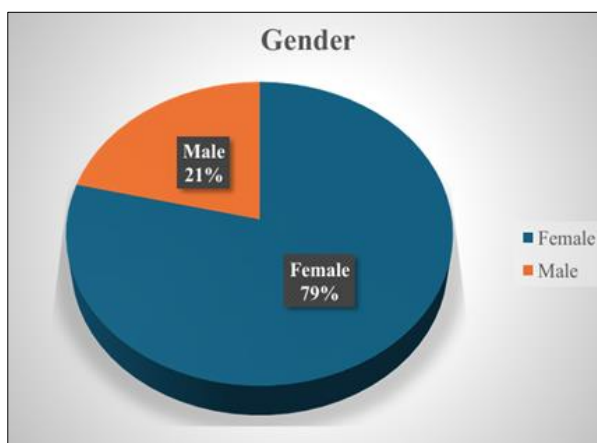
Age group	
21-35 years	161 (97.57%)
36- 50 years	4 (2.42%)



The age-wise distribution of the study participants. Out of the total 165 nurses, 161 (97.57%) were in the 21–35 years age group, while only 4 (2.42%) belonged to the 36–50 years age group. This indicates that the majority of participants were young adults, with very few participants from the older age group.

3.3. Gender Wise Distribution

Gender, n (%)	
Male	35 (21.21%)
Female	130 (78.78%)

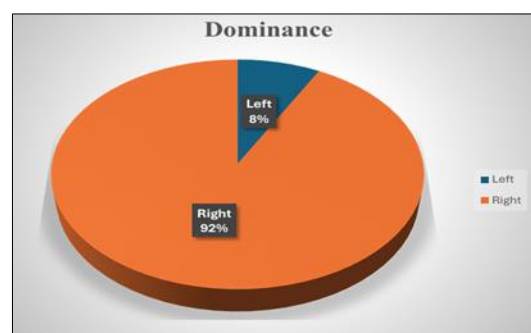
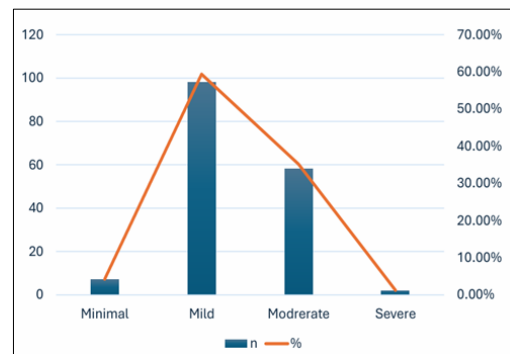


In study, from total 165 participants, 35 were males with (21%) and 130 were females with (79%).

3.4. Dominance Wise Distribution

Dominance, n (%)	
Left	13(7.87%)
Right	152(92.12%)

PRWHE	n	%
Minimal	7	4.2%
Mild	98	59.39%
Moderate	58	35.15%
Severe	2	1.21%



The dominance-wise distribution of the study participants. Out of the total 165 nurses, 152 (92.12%) were right-hand dominant, while 13 (7.87%) were left-hand dominant. This indicates that the majority of the participants were right-hand dominant.

3.5. PRWHE Findings

The PRWHE results demonstrated varying degrees of wrist and hand pain and functional limitation. Mild symptoms were the most frequently observed category (59.39%), followed by moderate symptoms (35.15%). Minimal symptoms were observed in 4.24% and severe symptoms in 1.21% of participants.

4. Discussion

The present cross-sectional study was conducted to determine the prevalence of repetitive strain injuries (RSIs) of the wrist and hand among nurses performing frequent intravenous (IV) cannulation and Clinical documentation. Assessment was carried out using the Patient-Rated Wrist and Hand Evaluation (PRWHE), a validated patient-reported outcome measure for wrist pain and functional disability.

The findings demonstrated that wrist and hand symptoms were common among nurses, with the majority reporting mild symptoms (59.39%), followed by moderate symptoms (35.15%), while only 4.2% had minimal symptoms and 1.21% experienced severe symptoms. These findings indicate that repetitive occupational tasks performed during routine nursing duties contribute substantially to wrist and hand discomfort, although severe disability remains relatively uncommon in this relatively young workforce.

The study population consisted predominantly of nurses aged 21–35 years (97.57%), with a mean age of 24.98 ± 3.71 years, and the majority were females (78.78%). This demographic profile is consistent with the workforce characteristics of many tertiary care hospitals where younger nurses constitute the largest proportion of clinical staff.

Furthermore, 92.12% of participants were right-hand dominant, suggesting repeated exposure of the dominant upper limb to occupational activities such as IV cannulation, medication administration, and electronic documentation.

Since these procedures require repetitive wrist movements, sustained gripping, precision hand movements, and prolonged static postures, the dominant hand is subjected to continuous biomechanical loading, increasing the likelihood of repetitive strain injuries. Similar occupational risk factors have been highlighted in previous studies evaluating work-related musculoskeletal disorders among nurses.^[6, 11, 15]

Participants in the present study had a mean clinical experience of 3.66 ± 2.57 years, worked approximately 48.24 ± 1.21 hours per week, and spent an average of 17.23 ± 4.59 hours per week performing clinical documentation. Extended working hours combined with repetitive documentation and repeated IV insertion may result in cumulative microtrauma of muscles, tendons, and surrounding soft tissues.

O'Neil *et al.* described repetitive occupational movements, awkward postures, forceful exertions, and inadequate ergonomic conditions as important contributors to upper extremity musculoskeletal disorders, while Van Tulder *et al.* emphasized repetitive movements and sustained postures as major occupational risk factors for RSI.^[1, 2]

Although previous studies have primarily focused on neck, shoulder, and low back disorders among nurses, the present findings extend existing evidence by specifically evaluating wrist and hand symptoms associated with repetitive Intravenous cannulation and clinical documentation.

Sun *et al.* conducted a meta-analysis involving more than 36,000 nurses and reported an overall annual prevalence of work-related musculoskeletal disorders of 77.2%, with the lower back (59.5%), neck (53.0%), and shoulders (46.8%) being the most commonly affected regions.^[11]

Similarly, Alzahrani *et al.* reported that repetitive movements, prolonged standing, awkward working postures, and manual patient care significantly increase the risk of musculoskeletal disorders among nurses.^[6] While these studies concentrated on general musculoskeletal disorders, the present study demonstrates that repetitive occupational exposure also contributes considerably to wrist and hand symptoms, an area that has received comparatively less attention in nursing research.

The findings of the present study are also comparable with those of Ayub *et al.* (2024), who reported a considerable prevalence of wrist and hand pain among healthcare professionals and identified repetitive manual tasks, prolonged static postures, and inadequate ergonomic awareness as important contributing factors. Their study

further demonstrated that healthcare professionals performing precision hand activities frequently experience functional limitations affecting occupational performance.^[16] Although their study included multiple healthcare professions, the occupational mechanisms responsible for wrist and hand pain are similar to those encountered by nurses performing repetitive IV insertion and documentation. The PRWHE was selected as the outcome measure because of its excellent psychometric properties for assessing wrist and hand pain and functional disability. Taylor and Kersten demonstrated that the PRWHE possesses strong validity, responsiveness, and clinical usefulness for evaluating wrist disorders.^[17] Furthermore, Packham and MacDermid confirmed excellent internal consistency and reliability using Rasch analysis, while Finsen *et al.* further supported the instrument's reliability for measuring patient-reported wrist outcomes.^[18, 19, 20] Therefore, the use of the PRWHE strengthens the methodological quality of the present study and increases confidence in the reported findings.

Punnett and Wegman (2004) reported that work-related musculoskeletal disorders (WMSDs) are strongly associated with occupational factors such as repetitive movements, awkward postures, forceful exertion, and prolonged exposure to physically demanding tasks. Their review highlighted that repetitive and sustained movements of the upper extremity can contribute to pain and functional limitations in the wrist and hand.^[21]

The present study has important clinical implications. Although severe wrist and hand disability was uncommon, almost all participants demonstrated some degree of pain or functional limitation. Early identification of repetitive strain injuries through routine occupational screening may facilitate timely physiotherapy intervention before symptoms progress. Implementation of ergonomic training programs, optimization of workstation design, appropriate scheduling of rest breaks, hand and wrist strengthening exercises, stretching programs, and education regarding proper IV insertion techniques may reduce cumulative mechanical loading and improve occupational health among nurses.

Overall, the present study demonstrates that repetitive wrist and hand symptoms are common among nurses engaged in frequent Intravenous cannulation and Clinical documentation.

The predominance of mild to moderate symptoms suggests that preventive ergonomic and physiotherapeutic interventions should be initiated early to minimize progression to chronic disability, improve occupational performance, and enhance the quality of healthcare delivery.

5. Conclusion

The present study demonstrates that wrist and hand symptoms were common among nurses performing intravenous cannulation and clinical documentation, with mild symptoms reported in 59.39% of participants and moderate symptoms in 35.15%. Severe symptoms were relatively uncommon.

The findings highlight the importance of recognising wrist and hand symptoms as an occupational health concern among nurses involved in repetitive and precision-based clinical tasks. Early screening, ergonomic education, adequate recovery periods, task modification and preventive physiotherapy may help reduce the progression of occupational wrist and hand problems.

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Disclosure Statement

The authors declare that there are no conflicts of interest related to this study.

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Ethics Statement

The study received approval from the Institutional Ethics Committee of Dr. Ulhas Patil College of Physiotherapy, Jalgaon. Written informed consent was obtained from all participants before data collection.

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